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Research report

Relation of parenting styles, feeding styles and feeding practices to child overweight and obesity. Direct and moderated effects ☆,☆☆

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ABSTRACT

The purpose of this study was to evaluate the direct and interacting relations of parenting styles, feeding styles, and feeding practices to child overweight and obesity. Participants were 144 mothers and children under 6 years of age. Mothers completed questionnaires about parenting and feeding styles and feeding practices. Researchers weighed and measured mothers and children or obtained measurements from a recent health report. Feeding practices were not directly related to child weight status. Compared to the uninvolved feeding style, authoritative and authoritarian feeding style categories were linked to lower odds of overweight. Feeding practices interacted with authoritative and authoritarian parenting styles to predict obesity. (1) Healthful modeling was associated with 61% (*OR* = 0.39) reduced odds of obesity in children of authoritative mothers but with 55% (*OR* = 1.55) increased odds in children of non-authoritative mothers and (2) covert control was linked to 156% (*OR* = 2.56) increased odds of obesity in children of authoritarian mothers but with 51% (*OR* = 0.49) decreased odds in children of non-authoritarian mothers. Healthful modeling interacted with feeding style demandingness to predict overweight and with responsiveness to predict obesity. Findings suggest the need for research and intervention on mechanisms mediating between feeding practices and obesity in families characterized by non-authoritative parenting styles.

Introduction

In recent years, childhood obesity research has become increasingly influenced by three parenting constructs: feeding practices, feeding styles, and general parenting styles (Hurley, Cross, & Hughes, 2011; Sleddens, Gerards, Thijs, De Vries, & Kremers, 2011; Ventura & Birch, 2008). Relations among the three constructs are complex (Blissett, 2011; Hennessy, Hughes, Goldberg, Hyatt, & Economos, 2010; Hubbs-Tait, Kennedy, Page, Topham, & Harrist, 2008) and findings on their association with child weight status are inconsistent. The purpose of the current report is to try to resolve some of these inconsistencies.

The conceptual framework for parenting and feeding styles stems from decades of research by Baumrind (2013) and the spe-

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cific model proposed by Darling and Steinberg (1993). It is this conceptual framework that helps explain why practices or styles alone do not consistently predict child outcomes. Whereas practices focus on *what* behaviors occur in parent–child interactions, styles refer to *how* those practices and behaviors are communicated (Darling & Steinberg, 1993). Styles moderate – enhancing or attenuating – the impact of practices on child outcomes (Darling & Steinberg, 1993). Both parenting and feeding styles are understood as the intersection of two dimensions (see Fig. 1). For example, high responsiveness and high demandingness characterize both authoritative parenting and feeding styles. However, there are two crucial differences between feeding styles and general parenting styles. For general parenting style, responsiveness and demandingness intersect to create an emotional climate across multiple parent–child interactions and contexts (Baumrind, Larzelere, & Owens, 2010; Henry & Hubbs-Tait, 2013); for feeding style, the intersection is in the feeding context alone (Hughes, Power, Fisher, Mueller, & Nicklas, 2005; Hughes et al., 2011) and includes specific feeding behaviors (e.g., spoon feed the child to get him/her to eat dinner; Hughes et al., 2006). Additionally, for general parenting style, child-centered (authoritative) demandingness is identified as firm behavioral control, high expectations, and provision of reasons and is differentiated from parent-centered (authoritarian) demandingness which is coercive, intrusive, and psychologically controlling (Baumrind, 2013; Henry & Hubbs-Tait, 2013). In contrast, the dimension of demandingness in feeding style includes both parent-centered and child-centered demands (Hughes et al., 2006, 2012), as shown in Fig. 1. Because feeding style by definition focuses on both style and behavior in the feeding situation, we propose that feeding style will be more closely related to child weight status than parenting style (Hypothesis 1).

In contrast to parenting and feeding styles, operational definitions of feeding practices range from specific behaviors (such as provision of particular foods and beverages) to a variety of controlling, modeling, and encouraging practices. As noted above, results on links of practices to child weight status are inconsistent. For example, allowing children to drink sweetened beverages has been linked to overweight and obesity in some studies (Blanchois, Farmer, Mannon, & Peterson, 2007) but not others (Newby et al., 2004). Parental control of child intake has been identified as positively (Kroller & Warschburger, 2008), negatively (Murashima, Hoerr, Hughes, & Kaplowitz, 2012), or not at all linked to child BMI or weight status (Matheson, Robinson, Varady, & Killen, 2006; May et al., 2007; Webber, Cooke, Hill, & Wardle, 2010).

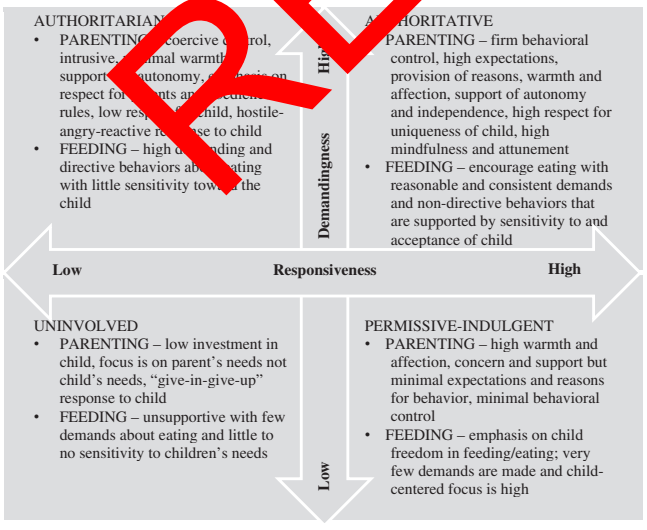

Fig. 1. Intersection of continuous responsiveness and demandingness dimensions to form parenting and feeding style categories.

Consistent with the Darling-Steinberg model (1993), we propose that it is the interaction of feeding practices with general parenting style that predicts child weight outcomes. Specifically, we propose (Hypothesis 2a) that: authoritative style leverages the influence of healthful practices on weight status and compensates for the negative impact of unhealthful practices. Furthermore, we propose (Hypothesis 2b) that: authoritarian and permissive general parenting styles impede the positive influence of healthful practices and exacerbate the negative influence of unhealthful practices. To facilitate hypothesis generation for future research, we also explored several research questions: (a) the moderating influence of feeding styles, (b) the relations of parenting and feeding styles to each other, and (c and d) to feeding practices.

Parenting and feeding styles and weight status

Research during childhood bearing on our first hypothesis is limited. In a sample of 9–11-year-old children, 60% of whom were overweight or obese, Hennessy et al. (2010) found that a permissive-indulgent feeding style significantly predicted child BMI *z*-score; however, none of the four general parenting style categories predicted child BMI *z*-score. (We added the term, indulgent, to the name of the permissive feeding style, because many studies in the feeding styles literature use this term.) Other studies have identified the permissive-indulgent feeding style as significantly related to higher child BMI *z*-scores (Hughes, Shewchuk, Baskin, Nicklas, & Qu, 2008; Hughes et al., 2005; Tovar et al., 2012). In research on general parenting styles, four studies have identified a significant relation between maternal parenting style and child weight status (Chen & Kennedy, 2005; Humenikova & Gates, 2008; Olvera & Power, 2010; Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006), whereas five have not (Agras, Hammer, McNicholas, & Kraemer, 2004; Blissett & Haycraft, 2008; Brann & Skinner, 2005; Gable & Lutz, 2000; Taylor, Wilson, Slater, & Mohr, 2011). One investigation (Wake, Nicholson, Hardy, & Smith, 2007) found significant relations between parenting style and weight status for fathers but not for mothers; another found a relation between parenting style and weight status for children of depressed mothers (Topham et al., 2010).

Of all investigations of general parenting styles, only two (Blissett & Haycraft, 2008; Wake et al., 2007) focused on children younger than age 6 years. The current study focuses on how parenting styles influence odds of overweight and obesity during early childhood to address the dearth of research and the urgency of identifying the correlates of overweight and obesity for US children under age 6 (Must, Phillips, & Naumova, 2012; Nader et al., 2006; Ogden, Carroll, Kit, & Flegal, 2012; Puhl & Latner, 2007).

To our knowledge, our second hypothesis about the moderating impact of parenting style on the link between feeding practices and odds of child overweight or obesity has not yet been evaluated. Sleddens et al. (2011) conducted a systematic review of the literature through 2010 that included identification of moderation effects. They did not report any studies examining the impact of moderation by general parenting style of the link between feeding practices and child weight status.

Feeding styles and practices

Hennessy et al. (2010) found that feeding style moderated the relation of restrictive feeding practices (but not pressure to eat or monitoring) to child BMI *z*-scores. The use of greater restriction by parents who were not classified as uninvolved in feeding style (i.e., who were authoritative, authoritarian, or indulgent) was re-

lated to lower BMI *z*-scores. In contrast, for uninvolved parents, the slope of the line for the relation of restrictive feeding to child BMI *z*-scores was flat. Thus, all feeding styles other than the uninvolved style reversed the link of restrictive feeding practices to increasing child BMI *z*-scores identified in some previous investigations (Joyce & Zimmer-Gembeck, 2009; Kroller & Warschburger, 2009). In sum, because only one study (Hennessy et al., 2010) has evaluated moderating effects of feeding styles on child BMI *z*-scores, we explored how feeding styles moderate the relation of feeding practices to child overweight and obesity.

Parenting styles, feeding styles, and feeding practices

Only one research team to date (Hennessy et al., 2010) has evaluated congruence of parenting and feeding styles. Furthermore, while many studies have examined feeding practices and child weight status, Hennessy, Hughes, Goldberg, Hyatt, and Economos (2012) recommend that researchers need to expand their focus to include both positive practices and parental controlling practices other than restriction, monitoring, and pressure to eat. Thus, we propose to evaluate the leveraging and compensatory effects of authoritative style on the relation to odds of child overweight and obesity of (a) parental modeling of healthful eating; (b) parent and child engagement in healthful eating and activity; and (c) parent and child avoidance of sweetened beverages, sedentary behavior, and fast food intake as well as (d) overt and (e) covert control over child eating (Ogden, Reynolds, & Smith, 2006) (Hypothesis 2a). We evaluate the exacerbating or impeding effects of authoritarian and permissive-indulgent parenting style on the relation of odds of overweight and obesity to the same five practices above (Hypothesis 2b).

Method

Participants

Participants were recruited from programs serving children and/or mothers meeting low-income guidelines. The sample consisted of 144 mothers and children under age 6 (71 girls and 73 boys; age: range = 2.78–5.85 years, mean = 4.4 [illegible]74). Participants resided in 7 states: Alabama, Indiana, Nebraska, Nevada, New York, North Dakota, and Oklahoma.

Procedure

Each state received Institutional Review Board approval prior to data collection and all participants provided written informed consent. All states followed a single protocol using an identical interview script and questionnaire. The only deviation allowed was whether the interviewer or the mother completed the form. If the mother completed the form, the interviewer watched closely for accuracy. With the exception of Oklahoma where bilingual English–Spanish interviewers were available, recruitment criteria limited subjects to English-speaking mothers. Maternal interviews (including height and weight measurement) lasted 30–60 min; child measurements were made at the same time or in a separate session for all children in one class, preschool, or center. Each state was responsible for entering their data into a unique Access database.

Measures

Parenting style

The *Parenting Behavior Questionnaire – Head Start* (PBQ-HS; Coolahan, McWayne, Fantuzzo, & Grim, 2002; McWayne, Owsianik, Green, & Fantuzzo, 2008) is a 40-item questionnaire adapted from the 62-item Parenting Practices Questionnaire (PPQ) originally developed by Robinson, Mandleco, Olsen, and Hart (1995) from 133 items drawn from Block's (1965) Child Rearing Practices Report or constructed to reflect Baumrind's authoritative, authoritarian, or permissive parenting style. The PBQ-HS was adapted for low-income preschool populations by Coolahan (1997) and has been utilized for both urban (Coolahan et al., 2002; McWayne et al., 2008) and rural (Hubbs-Tait et al., 2009) low-income samples.

The PBQ-HS is answered on a 4-point Likert-type scale, ranging from *almost never* to *almost always* (1–4), and consists of three subscales: active-responsive (authoritative), active-restrictive (authoritarian), and passive-permissive (permissive). The *permissive* subscale (McWayne et al., 2008) includes [illegible] items, such as: "I have a hard time saying "no" to my child," and "When my child doesn't do what I ask, I let it go or do it myself." The *authoritative* subscale includes 16 items such as: "I express affection by hugging, kissing, and holding my child," "I emphasize the reasons for rules," and "I encourage my child to think about the consequences of their actions." The *authoritarian* subscale includes 11 items, such as "I find punishment to be more effective than reasoning," "When my child asks why he/she has to do something, I say, 'Because I said so,'" and "When my child misbehaves, I get so frustrated that I say things I regret." Cronbach's alphas (α) for the authoritative, authoritarian, and permissive subscales in the current sample were .87, .82, and .84, respectively.

Feeding style

The *Caregiver's Feeding Styles Questionnaire* (CFSQ, Hughes et al., 2005, 2012) consists of 19 items answered on a 5-point Likert-type scale ranging from *never* to *always* (1–5). The seven child-centered directives include such items as "How often during the dinner meal do you compliment the child for eating food?" and "How often during the dinner meal do you say something positive about the food the child is eating during dinner." The 12 parent-centered feeding directives have the same initial stem and include the following endings: "Physically struggle with the child to get him or her to eat," "Warn the child that you will take away something other than food if he or she doesn't eat," and "Encourage the child to eat something by using food as a reward." Scores for the *demandingness* dimension are based on responses to all 19 questions whereas scores for the *responsiveness* dimension are computed from the following equation: mean of 7 child-centered items/mean of all 19 items (Hughes et al., 2005). Like Hughes et al. (2006), we explored separate contributions of child- and parent-centered demands but for a different reason: our integrative review emphasized conceptual differences (see Fig. 1) in demandingness between parenting and feeding styles. Cronbach's αs for all 19 demandingness items, the 12 parent-centered items, and the 7 child-centered items were .82, .80, and .56, respectively. Because there are no separate responsiveness items, no Cronbach's α can be calculated.

Feeding practices

The *Healthy Children Healthy Families Behavior Checklist* (*HCHF*, Dickin, Lent, Lu, Sequeira, & Dollahite, 2012) is a brief outcome evaluation tool developed as part of the *HCHF* curriculum used in the Expanded Food and Nutrition Education Program (EFNEP) in New York to assess child and adult eating and activity behaviors (e.g., vegetables, fruits, low fat dairy, soda, fast food, physical activity and screen time) and parenting practices that influence home environments (e.g. eating with children, and food availability). Items (16) were developed for and tested with low-income audiences using a 5-point response scale. Test–retest reliability and convergent validity were acceptable (Dickin et al., 2012). The cur-

rent study used two subscales, *healthy behaviors* (eight items: mother and child intake of fruits and vegetables, fruit availability in the home, eating meal together, and physical activity) and *limiting unhealthy behaviors* (five items: mother and child intake of soda, child television/video games/computer time; family fast food and take out consumption, and high-fat and high-sugar snack availability), with scales coded so that higher scores reflect more healthful practices. Cronbach's αs for the *healthy* and *limiting unhealthy behaviors* subscales were .73 and .81, respectively.

The *Parental Dietary Modeling Scale* (*PDMS*), consisting of six items, was developed after initial literature searches and formative research (focus groups) with African American parents and parent educators (Tibbs et al., 2001). It was validated in a study with African American parents, including lower income parents, of children ages 0–3 years to assess core constructs of parental modeling related to child dietary behavior. Four items were included in the current study and mothers ranked them on a 5-point Likert-type scale from *never* to *always* (1–5), for example: "How often do you eat food you want your child to eat" and "How often when you show your child you enjoy fruits and vegetables does your child eat them?" (Tibbs et al., 2001). Cronbach's α was .55 with higher scores indicating more desirable parental dietary modeling behaviors.

Ogden and colleagues (Brown & Ogden, 2004; Brown, Ogden, Vögele, & Gibson, 2008; Ogden et al., 2006) measured control that can be detected by a child (*overt control*) with four items rated from *never* to *always* (1–5), including: "How often are you firm about how much your child should eat?" (Ogden et al., 2006). Control that cannot be detected by a child (*covert control*) was assessed with five items ranked on the same scale, including: "How often do you not buy foods that you would like to because you don't want your children to have them" and "try not to eat unhealthy foods when your children are around" (Brown & Ogden, 2004; Brown et al., 2008; Ogden et al., 2006). Cronbach's αs for the overt and covert control scales were .62 and .80, respectively. Higher mean scores on each scale indicated higher levels of controlling control.

Anthropometrics

Mother and child BMI were measured by the researcher (119 children [82.6%] and 129 mothers [89.6%]) or obtained from a recent written measurement by a health provider. Measurement of mothers and children followed standard procedures (Centers for Disease Control, 2009) with minimal variation between sites in specific height and weight instruments.

Data analysis

We used the criteria for median splits (demandingness criterion = 2.80; responsiveness criterion = 1.16) recommended by Hughes et al. (2012) to construct CFSQ feeding style categories and followed the usual (e.g., Hughes et al., 2008, 2012) procedure of creating CFSQ style groups by dividing the demandingness and responsiveness dimensions at ⩽ versus > median: authoritative = demandingness > 2.80 and responsiveness > 1.16; authoritarian = demandingness > 2.80 and responsiveness ⩽ 1.16; permissive-indulgent = demandingness ⩽ 2.80 and responsiveness > 1.16; uninvolved = demandingness ⩽ 2.80 and responsiveness ⩽ 1.16. Two dichotomous weight status outcomes were evaluated: obesity (≥95th percentile) and overweight and above (≥85th percentile), referred to hereafter as overweight.

Links of child weight status to feeding practices, parenting styles, and feeding styles were evaluated in three ways: (a) the relations of continuous feeding practices, parenting styles, and CFSQ dimensions to child weight status outcomes were evaluated by Pearson product-moment correlations, (b) the main effect of CFSQ feeding style categories on child BMI *z*-scores was evaluated with one-way analysis of variance (ANOVA), and (c) the main effect of CFSQ feeding style categories on odds of child obesity and overweight was evaluated with logistic regression (with the uninvolved style as the reference group). In addition, relations among parenting styles, feeding styles, and feeding practices were evaluated with correlations for continuous measures and by ANOVAs for the four CFSQ feeding style categories.

The moderating effects of parenting styles on the relation between feeding practices and odds of child obesity and overweight (Hypotheses 2a and 2b) were evaluated with hierarchical logistic regression. To construct dichotomous parenting style predictors (e.g., high versus low authoritative), median splits (⩾ median versus < median) were performed for each PBQ-HS parenting style. One parenting style and one feeding practice predictor variable were entered in the first block. The interaction term was entered in the second block of the regression. All analyses were conducted with maternal BMI controlled in the first block. To guard against the partialling fallacy (Gordon, 1968, pp. 592–593), that is, not covarying the crucial relationship out of itself, we added control for maternal ethnicity (1 = Hispanic; 0 = not Hispanic), education (levels 1–7, see Table 1), and marital status (1 = married; 0 = not married) only for significant interactions. Based on McClelland and Judd's (1993) finding that 91% of simulated correlational studies make Type II errors in the detection of moderation effects, significance levels for moderation were set at < .10. Although this increases the possibility of Type I error, it is less generous than significance levels of .15 that have been implemented for testing moderation (e.g., Durand, Dunton, Spruijt-Metz, & Pentz, 2012).

The moderating effects of CFSQ feeding styles on odds of overweight and obesity were evaluated in two ways: (a) hierarchical logistic regressions with feeding styles as categorical variables and (b) hierarchical logistic regressions with CFSQ responsiveness and demandingness dimensions dichotomized at the median. All data analyses were conducted with IBM SPSS 19.0. Unless otherwise specified, significance levels were set at $p \leqslant .05$.

Table 1
Characteristics of low-income mother sample ($n = 144$).

Characteristic	% (*n*)
Race/ethnicity	
– White	56.2 (81)
– Black	15.3 (22)
– American Indian/Alaskan Native	4.2 (6)
– Asian	1.4 (2)
– Latina/hispanic ethnicity	27.8 (40)
– No race/missing	0.7 (1)
Education	
<High school	9.7 (14)
High school or GED	25.0 (36)
Some college or technical school	50.7 (73)
4-yr Degree or more	14.6 (21)
Employment status	
Home maker	37.5 (54)
Not employed	20.1 (29)
Part-time	16.7 (24)
Full-time	24.3 (35)
Missing	1.4 (2)
Marital status	
– Married	53.5 (77)
– Cohabitating	12.5 (18)
– Separated or divorced	12.5 (18)
– Single	21.5 (31)
Household size	Mean (SD) = 4.40 (1.52)
Number of children in family	Mean (SD) = 2.38 (1.10)

Results

Descriptive statistics

Table 1 presents descriptive statistics. Race and ethnic group self-identification exceeds 100% because eight participants identified themselves as belonging to more than one category. All families in the sample received at least one form of social or food assistance (e.g., Head Start, Supplemental Nutrition Assistance Program, and Special Supplemental Nutrition Program for Women, Infants and Children).

Table 2 presents descriptive statistics for all predictor variables. For general parenting style, mothers' authoritative scores were higher than their authoritarian, t (143) = 21.05, p < .0001, and permissive, t (143) = 23.08, p < .0001, scores. For CFSQ dimensions, median demandingness was 2.79, identical to two samples reported by Hughes et al. (2012); median responsiveness was 1.21, identical to one sample reported by Hughes et al. (2012). Implementation of the pooled criteria recommended by Hughes et al. (2012) resulted in the following distribution of mothers in the four feeding styles: 26 authoritative (18.1%); 62 indulgent (43.1%); 40 authoritarian (27.8%); 16 uninvolved (11.1%).

Mean mother BMI was 29.97 (SD = 8.34) and mean child BMI z-score was .68 (SD = 1.07). Table 2 compares mothers and children in underweight, normal, overweight, and obese classifications. There was significant overlap between mothers and children in the normal and underweight versus obese and overweight categories, χ^2 (4) = 17.18, p = .002 (with underweight and normal weight cells combined to prevent violation of the assumption of cell frequency $\geqslant$ 5).

Research questions and hypotheses

Associations among parenting and feeding styles, practices, BMI, and obesity status

Table 3 depicts correlations among maternal PBQ-HS parenting styles, CFSQ feeding style dimensions, healthy and unhealthy feeding and activity practices, and BMI, as well as child BMI z-score and overweight and obesity status. Correlations among parenting styles, feeding styles, and practices address research questions. Correlations of feeding styles or general parenting styles to child weight status evaluate Hypothesis 1.

PBQ-HS parenting styles were significantly related in expected directions to CFSQ responsiveness but not to CFSQ demandingness. CFSQ demandingness was unrelated to the authoritarian parenting style and significantly positively correlated with the permissive style. The separation of CFSQ child-centered from parent-centered demands clarifies these relations, with parent-centered demands responsible for the correlation between permissive parenting style and CFSQ demandingness. Exploratory analyses of permissive style items that were significantly correlated with CFSQ demandingness confirmed this. Identified items (and coefficients for total demandingness, parent-centered demands) were as follows: I tell my child I am going to punish him/her but do not do it (r = .26, .32); when I want my child to stop doing something, I ask him/her many times to stop (r = .38, .42); I find it difficult to discipline my child (r = .24, .28); and I threaten my child with punishment more than I actually do it (r = .23, .30). Only one correlation – between child-centered demands and permissive asking children to stop many times – reached significance (r = .18). Thus, parent-centered demands drive the significant correlation between CFSQ demandingness and permissive parenting style.

All three PBQ-HS parenting styles were significantly related to HCHF limiting unhealthy behaviors (coded so that higher scores reflect lower levels of soda consumption, TV watching, and high fat snacks), whereas both CFSQ feeding style dimensions were significantly related to HCHF healthy behaviors. Other than HCHF practices, the only feeding practice linked to parenting or feeding styles was parental modeling (PDMS); it was significantly related to PBQ-HS permissive scores (negatively) and to the CFSQ responsive dimension (positively).

Table 3 provides support for Hypothesis 1, that feeding style would be more closely related to child weight status than general parenting style. CFSQ demandingness, and specifically child-cen-

Table 2
Parenting styles, feeding styles, feeding practices, and weight status (n = 144).

	Mean (SD)	Range (possible)
Parenting and feeding styles (continuous measures)		
PBQ-HS authoritative parenting	3.49 (.46)	2.25–4.00 (1.00–4.00)
PBQ-HS authoritarian parenting	1.89 (.57)	1.00–3.50 (1.00–4.00)
PBQ-HS permissive parenting	1.81 (.58)	1.00–4.00 (1.00–4.00)
CFSQ responsiveness	1.20 (.15)	0.82–1.77
CFSQ demandingness	2.82 (.54)	1.26–4.58
Feeding practices		
HCHF healthy	3.95 (.66)	2.13–5.00 (1.00–5.00)
HCHF limiting unhealthy	3.24 (1.10)	1.20–5.00 (1.00–5.00)
PDMS	3.99 (.66)	2.25–5.00 (1.00–5.00)
Overt	3.89 (.68)	1.50–5.00 (1.00–5.00)
Covert	3.31 (.78)	1.00–5.00 (1.00–5.00)

BMI category frequencies (%)

Child BMI category	Mother BMI category				
	Underweight	Normal weight	Overweight	Obese	Child total
Underweight	0	0	0	1	1 (0.7)
Normal weight	3	32	26	31	92 (63.9)
Overweight	0	6	12	11	29 (20.1)
Obese	0	3	2	17	22 (15.3)
Mother total	3 (2.1)	41 (28.5)	40 (27.8)	60 (41.7)	144 (100)

Note: Parenting style was measured by Parenting Behavior Questionnaire-Head Start (PBQ-HS, Coolahan et al., 2002) and feeding style, by the Caregiver's Feeding Style Questionnaire (CFSQ, Hughes et al., 2005). Feeding practices were measured with the Healthy Children Healthy Families Behavior Checklist (HCHF BC, Dickin et al., 2012), the Parental Dietary Modeling Scale (PDMS, Tibbs et al., 2001), and Overt and Covert Control (Ogden et al., 2006).

Table 3
Correlations of continuous measures of styles and practices with weight measures (n = 144).

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. PBQ-HS authoritative	1.000														
2. PBQ-HS authoritarian	**−0.564**	1.000													
3. PBQ-HS permissive	**−0.407**	**0.607**	1.000												
4. CFSQ responsive	**0.256**	**−0.319**	**−0.359**	1.000											
5. CFSQ demanding	**0.264**	0.001	**0.170**	**−0.498**	1.000										
6. CFSQ child centered	**0.462**	**−0.213**	−0.075	**0.176**	**0.755**	1.000									
7. CFSQ parent centered	0.114	0.111	**0.265**	**−0.752**	**0.942**	**0.490**	1.000								
8. HCHF healthy	0.145	−0.126	−0.018	**0.286**	**−0.207**	−0.010	**−0.270**	1.000							
9. HCHF limiting unhealthy	**0.417**	**−0.384**	−0.382	**0.188**	−0.020	0.092	−0.074	0.052	1.000						
10. PDMS	0.136	−0.157	**−0.183**	**0.322**	−0.096	0.146	**−0.202**	**0.357**	0.003	1.000					
11. Overt	−0.076	0.086	−0.039	−0.111	0.118	0.091	0.111	0.098	−0.068	**0.2**	1.000				
12. Covert	−0.105	−0.024	−0.074	0.153	−0.115	−0.001	−0.153	**0.247**	−0.092	**6**	**0.198**	1.000			
13. Mother BMI	−0.047	0.042	0.007	−0.059	−0.055	−0.109	−0.017	−0.112	−0.087	0.039	−0.066	−0.1	1.000		
14. Child BMI-z	−0.062	−0.021	−0.012	0.046	**−0.184**	**−0.164**	−0.160	−0.033	−0.014	0.049	−0.038	0.002	0.150	1.000	
15. Child overweight	−0.137	0.046	0.023	0.021	**−0.184**	**−0.170**	−0.157	−0.009	0.0	−0.0	0.023	.016	**0.164**	**0.779**	1.000
16. Child obesity	−0.043	−0.011	−0.016	−0.016	−0.111	−0.129	−0.081	−0.06	0.049	−0.01	0.0	0.055	**0.267**	**0.682**	**0.573**

Note: Boldface font designates significant correlations. Correlations greater than ± .163 are significant at p < .05; correlations greater than ± .214 are significant at p < .01; all tests are two tailed. Overweight (⩾ 85%tile) and obese (⩾ 95%tile) categories are not independent. Columns 6 and 7 are CFSQ demandingness components; correlations with column 5 reflect identical items.

Table 4
Results of analysis of variance of differences in feeding practices, parenting styles, and weight status between CFSQ feeding style categories.

	Feeding practices [Mean (SD)]				
CFSQ style	HCHF healthy	HCHF limiting	PDMS	Overt	Covert
Authoritative	4.04 (0.61)	3.16)	4.12 (0.62)	3.91 (0.67)	**3.50 (0.55)[a]**
Indulgent	**4.10 (0.61)[a]**	3.25 (1.0)	**4.15 (0.59)[a]**	**3.82 (0.63)[b]**	3.36 (0.70)
Authoritarian	**3.68 (0.74)[b]**	3.36 (0.6)	**3.75 (0.67)[b]**	**3.86 (0.52)[b]**	**2.98 (0.82)[b]**
Uninvolved	3.87 (0.59)	2.70	3.81 (0.80)	**4.38 (0.44)[a]**	**3.61 (1.03) [a]**
F value	**3.79, *p* = .012**	1 , *p* = .186	**3.81, *p* = .012**	**3.37, *p* = .020**	**3.96, *p* = .010**
PBQ parenting styles or weight measures [Mean (SD)]					
CFSQ style	Authoritative	Au itarian	Permissive	Mother BMI	Child BMI *z*
Authoritative	**3.75 (.27)[b]**	**1.61 ( )[b]**	**1.54 (.34)[b]**	28.76 (7.80)	0.44 (0.97)
Indulgent	**3.43 (46)[a,d]**	**1.85 (.62)[b]**	1.78 (.60)	30.30 (8.02)	0.81 (1.18)
Authoritarian	**3.58 0)[a]**	1.94 (.45)	**1.98 (.53)[a]**	30.05 (9.46)	0.44 (1.00)
Uninvolved	**3 (.66)[b]**	**2.34 (.68)[a]**	1.98 (.72)	30.48 (7.97)	1.16 (0.74)
F value	**.96, *p* < .0**	**6.09, *p* = .001**	**3.85, *p* = .011**	0.23, *p* = .87	2.59, *p* = .055

Notes: Bold face font indicates sig ca (*p* < .05). Within column means with a superscript of "a" or "c" are greater than means with a superscript of "b" or "d", respectively, according to the Tukey HSD criterio < .05).

tered demand nes was sig cantly negatively related to child BMI *z*-scores and erweight. None of the general parenting styles measures was sig cantly related to child BMI *z*-scores, overweight, or obesity. As a more stringent test of Hypothesis 1, we entered the three measures of general parenting style in the first block of a hierarchical multiple regression and then entered CFSQ demandingness in the second block. The total R^2 for general parenting styles was not significant, R^2 = .01, p = .752. However, entering demandingness in the second block yielded $R^{2\text{change}}$ = .03, p = .047. Thus, with parenting style controlled, there is a small and significant effect size for the link between child weight status and CFSQ demandingness.

Main effects of CFSQ categories

Table 4 depicts means and results of analyses of variance (ANOVAs) of differences in feeding practices, parenting styles, and mother BMI and child BMI *z*-scores among the four CFSQ categories. Hypothesis 1 is evaluated by one ANOVA testing significant differences in child BMI *z*-scores among CFSQ categories. The other nine ANOVAs are exploratory analyses to answer research questions. In support of Hypothesis 1, the ANOVA of group differences in child BMI-*z* score approached significance (see Table 4) and logistic regressions evaluating odds of BMI ⩾ 85th percentile as a function of authoritative, indulgent, and authoritarian feeding styles (with maternal BMI controlled) were significant. With CFSQ uninvolved parents as the reference group, lower odds of BMI ⩾ 85th percentile were linked to authoritative, B = −1.68, OR = 0.19, CI: 0.05–0.74, p = .017, and authoritarian feeding styles, B = −1.50, OR = 0.22, CI: 0.06–0.77, p = .018, with indulgent styles approaching significance, B = −.98, OR = 0.37, CI: 0.12–1.18, p = .092. In contrast to findings for odds of BMI ⩾ 85th percentile, odds of BMI ⩾ 95th percentile were not linked to feeding styles. There were no differences in maternal BMI as a function of CFSQ group (see Table 4).

Consistent with our expectation of *congruence between parenting and feeding styles*, mothers in the uninvolved feeding style

Table 5
Logistic regressions evaluating interaction effect of parenting styles and practices on obesity.

Effect	B	*SE*	*OR*	*P*	95% *CI*
Parenting style × feeding practice					
Authoritative × HCHF healthy	0.47	0.75	1.60	0.531	0.37–7.00
Authoritative × HCHF Limiting Unhealthy	−0.06	0.48	0.94	0.905	0.37–2.40
Authoritative* × *PDMS	**−1.52**	**0.77**	**0.22**	**0.047**	**0.05–0.98**
Authoritative × Overt	0.25	0.73	1.28	0.732	0.31–5.37
Authoritative × Covert	−0.70	0.64	0.50	0.275	0.14–1.74
Authoritarian × HCHF healthy	0.79	0.77	2.21	0.302	0.49–9.95
Authoritarian* × *HCHF limiting unhealthy	**0.84**	**0.47**	**2.31**	**0.075**	**0.92–5.78**
Authoritarian × PDMS	1.12	0.80	3.05	0.163	0.64–14.58
Authoritarian × Overt	0.94	0.72	2.55	0.193	0.62–10.43
Authoritarian* × *Covert	**1.77**	**0.75**	**5.87**	**0.019**	**1.34–25.62**
Permissive × HCHF healthy	−0.88	0.74	0.42	0.2	0.10–1.77
Permissive × HCHF unhealthy	−0.03	0.46	0.98	.956	0.40–2.41
Permissive × PDMS	−0.72	0.77	0.49	0.349	0.11–2.20
Permissive × Overt	−1.20	0.75	0.30	0.110	0.07–1.31
Permissive × Covert	0.26	0.32	1.30	.419	0.69–2.45
Tests of simple effects for significant Interactions	*B*	*SE*	*OR*	*P*	95% *CI*
Authoritative × PDMS					
PDMS for authoritative	**−0.95**	**0.58**	**0.39**	**0.098**	**0.12–1.19**
PDMS for non-authoritative	0.44	0.50	1.55	0.3	0.59–4.09
Authoritarian × HCHF limiting unhealthy					
Limiting unhealthy for authoritarian	0.33	0.31	1.40	0.281	0.76–2.56
Limiting unhealthy for non-authoritarian	**−0.62**	**0.37**	**.54**	**0.095**	**0.26–1.12**
Authoritarian × covert control					
Covert control for authoritarian	**0.95**	**0.4**	**2.56**	**0.035**	**1.07–6.20**
Covert control for non-authoritarian	−0.72	0.3	0.49	0.216	0.15–1.52

Note: Maternal BMI was controlled in all analyses. Boldfaced coefficients indicate a significant effect with p < .0.

group were significantly less authoritative in parenting style th… mothers in all other CFSQ groups. Mothers in the CFSQ authorit… tive feeding group were also significantly more authoritative i… parenting style than mothers in the CFSQ indulgent fe…g style group. In contrast to the congruence expectation, th… CFSQ unin-volved group had the highest authoritarian par…ing styl… mean score. Also in contrast to the congruence e…ctati… authoritarian mothers had higher permis…e scor…han CFSQ authoritative mothers.

Significant differences in feeding p…ctic… between C…Q feeding styles categories also are depicted in Tabl… Indulgent mothers exhibited higher levels of H…F healthy and…DMS modeling practices than authoritarian m…thers. Uninvolved m…others exhibited significantly higher le…s of ov…t control than indulgent or authoritarian mothers, and …nifi…antly hi…her levels of covert control than authorita…a moth…s. Autho…tative mothers exhibited more covert c…ntrol t…n auth…rita…an mothers.

Moderation by par…ti…g styles (Hypotheses 2a and 2b)

None of the logis… regressions evaluating odds of overweight as a function of interac…s between parenting styles and feeding practices was significant. Three interactions predicted odds of obesity. Results of all logistic regressions for two-way interactions between parenting styles and feeding practices for child obesity are depicted in Table 5.

As hypothesized, the *authoritative parenting style* did leverage the impact of parental healthful modeling on odds of child obesity. Results of tests for simple effects of healthful modeling on child obesity (see bottom of Table 5) showed that healthful modeling is associated with 61% (*OR* = 0.39) lower odds of obesity in children of authoritative mothers, whereas it is associated with 55% (*OR* = 1.55) increased odds of obesity in children of non-authoritative mothers. It is important to note, that adding controls for maternal education, Hispanic versus non-Hispanic ethnicity, and married versus not-married status did not meaningfully alter the results for the authoritative by PDMS interaction depicted in Table 5; …changes include $B = -1.55$, $SE = 0.79$, $p = .049$, …21, $CI = 0.04–0.99$.

For …*thoritarian parenting style*, two interactions were significant: between style and HCHF limiting unhealthy behaviors and between style and covert control. Tests for simple effects of limiting unhealthy behaviors on obesity (see Table 5) revealed that limiting unhealthy practices was associated with 46% reduced odds of obesity (*OR* = 0.54) in children of non-authoritarian mothers and with 40% increased odds of obesity in children of authoritarian mothers (*OR* = 1.40). Analogous logistic regressions for simple effects of covert control on obesity (see Table 5) revealed covert control was associated with 156% (*OR* = 2.56) increased odds of obesity in children of authoritarian mothers and with 51% (*OR* = 0.49) decreased odds of obesity in children of non-authoritarian mothers). Controls for maternal education, Hispanic versus non-Hispanic ethnicity, and married versus not-married status did not meaningfully alter the results depicted in Table 5 for the interaction of authoritarian parenting style with covert control or limiting unhealthy practices. For *permissive parenting style*, none of the interactions with feeding practices was significant in predicting odds of obesity.

Moderation by feeding style categories and dimensions

None of the interactions of feeding practices and feeding style categories as related to odds of obesity or overweight reached significance. Therefore, we explored the moderating effect of CFSQ feeding styles by conducting logistic regressions, first, of odds of overweight and, second, of odds of obesity with the responsiveness or demandingness dimension as the moderator and maternal BMI controlled (see Table 6).

The distinction between high (>2.80) versus low (≤2.80) demandingness predicted lower odds of overweight, with children of high demanding mothers having lower odds: $B = -0.88$, *OR* = 0.42, *CI*: 0.20–0.87, $p = .020$. The interaction between demandingness and PDMS was significant (Table 5). For the 66 mothers higher in demandingness, healthful modeling was not

Table 6
Logistic regressions evaluating interaction effect of feeding style dimensions and practices on obesity and overweight.

Interaction effect–child weight status outcome	*B*	*SE*	*OR*	*P*	95% *CI*
Feeding style dimension × feeding practice-overweight					
Responsiveness × HCHF healthy	−0.16	0.56	0.98	0.984	0.33–2.92
Responsiveness × HCHF unhealthy	−0.29	0.34	0.39	0.750	0.39–1.45
Responsiveness × PDMS	−0.15	0.57	0.86	0.797	0.28–2.66
Responsiveness × Overt	−0.15	0.56	0.86	0.790	0.29 –2.57
Responsiveness × Covert	−0.75	0.48	0.47	0.120	0.18–1.22
Demandingness × HCHF healthy	0.02	0.56	1.02	0.971	0.34–3.03
Demandingness × HCHF unhealthy	0.36	0.36	1.44	0.318	0.71–2.92
Demandingness × PDMS	**1.16**	**0.59**	**3.20**	**0.048**	**1.01–10.09**
Demandingness × Overt	−0.36	0.56	0.70	0.520	0.23–2.09
Demandingness × Covert	0.66	0.51	1.93	0.198	0.71–5.28
Feeding style dimension × feeding practice-obesity					
Responsiveness × HCHF healthy	−0.34	0.74	0.64	0.709	0.17–3.02
Responsiveness × HCHF unhealthy	−0.24	0.47	0.61	0.787	0.31–1.97
Responsiveness × PDMS	**−1.94**	**0.86**	**0.14**	**0.024**	**0.03–−0.78**
Responsiveness × Overt	−0.47	0.75	0.63	0.531	0.14- 2.71
Responsiveness × Covert	−1.10	0.68	0.33	[illegible]	0.09–1.27
Demandingness × HCHF healthy	−0.15	0.75	0.8[illegible]	0.8[illegible]	0.20–3.70
Demandingness × HCHF unhealthy	0.23	0.49	[illegible]	0.634	0.48–3.32
Demandingness × PDMS	0.10	0.76	1.1[illegible]	0.[illegible]93	0.25–4.87
Demandingness × Overt	−1.16	0.82	0.31	[illegible]154	0.06–1.55
Demandingness × Covert	0.48	0.74	1.62	0.513	0.38–6.86

Note: Maternal BMI was controlled in all analyses. Boldfaced coefficients indicate a significant interaction effect with $p < .10$.

linked with odds of child overweight: *B* = 0.24, *OR* = 1.27, *CI*: 0.54–2.98, *p* = .586. For the 78 mothers lower in demandingness, healthful modeling was linked with reduced odds: *B* = −0.94, *OR* = .39, *CI*: 0.18–0.85, *p* = .018. Thus, increasing PDMS modeling compensated for mothers' lower demandingness and reduced children's odds of BMI ⩾ 85th percentile.

For odds of obesity, the distinction between high (>1.16) versus low (≤1.16) responsiveness was not significant. However, the interaction between responsiveness and PDMS modeling was significant. For mothers above the median on responsiveness, PDMS modeling was related to lower odds of child obesity, *B* = −0.76, *OR* = 0.47, *CI*: 0.17–1.31, *p* = .149, whereas for mothers below the median, PDMS modeling was related to higher odds, *B* = 1.35, *OR* = 3.87, *CI*: 0.86–17.47, *p* = .079. Controls for ethnicity, marital status, and education did not alter the demandingness by PDMS modeling or responsiveness by PDMS modeling interaction effects.

Discussion

The current study is to the best of our knowledge, the first to evaluate both direct and moderated relations of general parenting styles, feeding styles and feeding practices to child BMI *z*-scores and overweight or obesity. We confirmed Hypothesis 1, that feeding styles would be directly related to weight status in preschool children, in three sets of analyses: correlational analyses of the links of continuous feeding style dimensions to child BMI *z*-scores, an ANOVA, and a logistic regression of the link between feeding style categories and odds of BMI ⩾ 85th percentile. We also found evidence confirming Hypothesis 2, that general parenting styles would moderate the relation of feeding practices to child weight status. Like other research on preschool children (May et al., 2007; Newby et al., 2004), we found no evidence for a significant link between feeding practices before the age of 6 and children's BMI *z*-scores. However, we did find that the demandingness dimension of feeding styles interacted significantly with one feeding practice to impact odds of BMI ⩾ 85th percentile. We will consider each of these main findings sequentially.

Previous research by Hughes and colleagues confirmed the direct relation of feeding style categories to child BMI *z*-scores (Hennessy et al., 2010; Hughes et al., 2008; Tovar et al., 2012). The current study extends these findings in several ways. First, we found that, of the two CFSQ dimensions, only demandingness is significantly negatively correlated with child BMI *z*-scores and with the classification of children as having BMI ⩾ 85th percentile. Similarly, we found that, compared to the uninvolved feeding style, odds of BMI ⩾ 85th percentile were lower among children whose parents endorsed the authoritative and authoritarian feeding styles – the two feeding styles that are above the median on demandingness. Both findings highlight the necessity of parents' setting appropriate limits in the feeding situation and underscore previous evidence linking higher child BMI *z*-scores to the permissive-indulgent feeding style which features low demandingness (Hennessy et al., 2010; Hughes et al., 2008; Tovar et al., 2012). However, in the current study, the comparison of the permissive-indulgent feeding style to the uninvolved reference group approached significance with the children of indulgent parents having lower odds of BMI ⩾ 85th percentile. We did not find any significant interactions between CFSQ feeding styles and feeding practices that might explain this trend. However, we did find that CFSQ permissive-indulgent mothers were more authoritative and less authoritarian in general parenting style than uninvolved mothers which may explain some of the different relations of these two feeding styles to child weight status.

Consistent with the different conceptual frameworks and operational definitions of parenting and feeding styles, our exploratory analyses did not find complete congruence between the two but did yield findings to generate productive hypotheses. In particular, we found that the feeding style demandingness dimension was unrelated to the authoritarian parenting style but modestly correlated with the authoritative and permissive parenting styles. These findings are clarified by the divergent correlations of child- versus parent-centered demands to parenting styles, with child-centered demands inversely and parent-centered demands positively (albeit not significantly) correlated with authoritarian style. The closer link of CFSQ child- than parent-centered demandingness to the authoritative and parent- than child-centered demands to the authoritarian parenting style suggests that child-centered feeding demands overlap with the high expectations of the general authoritative parenting style and parent-centered feeding demands overlap with the punishment and obedience of the general authoritarian parenting style (see Fig. 1). Future research might

systematically explore this hypothesis and also separately target child- versus parent-centered demands in obesity prevention efforts.

Part of the explanation of the correlation of CFSQ demandingness with the permissive parenting style appears to be the measurement of permissive parenting by the PBQ-HS (Coolahan et al., 2002; McWayne et al., 2008). The permissive parenting style scale of the original Parenting Practices Questionnaire (PPQ, Robinson et al., 1995) included three subscales: Lack of Follow Through, Ignoring Misbehavior, and [Low] Self-Confidence. In the adaptation of the PPQ for the PBQ-HS for low-income parents, the Ignoring Misbehavior items (e.g., withholding scolding) were dropped due to poor comprehensibility (Coolahan, 1997, p. 125). Our finding of significant inverse correlations for the PBQ-HS permissive parenting style with healthy modeling and limiting unhealthy practices as well as the nature of the permissive items themselves (e.g., I tell my child I am going to punish him/her but do not do it) suggest that the PBQ-HS permissive style reflects inconsistency in limit setting (i.e., the Lack of Follow Through factor). This interpretation is also congruent with our finding that PBQ-HS permissive (i.e., inconsistent) style is inversely correlated with CFSQ responsiveness.

In this study, general parenting style was not directly related to child BMI *z*-score and weight status. This finding is consistent with previous research confirming the null hypothesis for the relation of general parenting style to various child weight outcomes (Agras et al., 2004; Blissett & Haycraft, 2008; Brann & Skinner, 2005; Gable & Lutz, 2000; Taylor et al., 2011). However, congruent with the Darling and Steinberg (1993) conceptual model and in support of Hypotheses 2a and 2b, the current study extends previous findings to show that general parenting style moderated the relation of feeding practices to child weight outcomes. The significant interaction effects emphasize that links between feeding practices and child weight status may occur only in combination with particular parenting styles and illustrate the point made long ago by Baron and Kenny (1986) that combining subpopulations or conditions with effects in opposite directions will lead to the absence of a meaningful relation between a predictor and an outcome in the general population. In contrast, moderators (effect modifiers) stipulate the conditions under which predictors and outcomes are related (Little, Card, Bovaird, Preacher, & Crandall, 2007; MacKinnon & Luecken, 2008). In the current study healthful modeling was related to decreased likelihood of obesity in children of authoritative mothers and increased odds in children of non-authoritative mothers. The difference between 6% decreased versus 55% increased odds between the two groups is greater than the public health impact of differences in odds for obesity linked to the *FTO* gene for two groups – physically active versus inactive adults – identified by Kilpeläinen et al. (2011). Analogously, in the current study covert feeding practices by authoritarian mothers were related to increased odds of obesity. Similarly, only for less authoritarian mothers were HCHF limiting unhealthy behaviors linked to lower odds of obesity.

Thus, the current study specifies some of the conditions for the association between obesity and feeding practices. It does not shed light on the mechanism that explains why modeling decreases odds of obesity for children of authoritative mothers and has the opposite effect for children of non-authoritative mothers. Research on parenting style has long documented that authoritative parents are more attuned and responsive to child needs and behavior (Pratt, Kerig, Cowan, & Cowan, 1988). Kochanska (1997) found preschool children of mothers higher in responsive orientation were more likely to comply with mothers' requests and rules than preschool children of less responsive mothers. Thus, one mechanism linking healthful modeling to lower obesity may be that children of authoritative mothers will be more likely to imitate healthful modeling in contrast to children of non-authoritative mothers. An alternative explanation is that authoritative parenting style fosters child emotion regulation (Morris, Silk, Steinberg, Myers, & Robinson, 2007), which, in turn, is linked to lower child emotional eating (Harrist, Hubbs-Tait, Topham, Shriver, & Page, in press). Child emotional eating by children of non-authoritative parents would interfere with the influence of parental healthful modeling on child obesity. By identifying parenting style as a moderator, the current study sets the stage for research on the mechanisms that mediate between feeding practices and obesity in families characterized by non-authoritative or authoritarian parenting styles. The importance of identifying moderators as a first step to identifying mechanisms has long been recognized (Baron & Kenny, 1986; Little et al., 2007).

Implications of the significant interactions and these potential mechanisms for nutrition educators, parenting practitioners, and health care providers in their attempts to stem the tide of obesity include the following: first, adding interventions components that foster authoritative parenting style is critical to future intervention and prevention studies because the current study shows that modeling is linked to lower risk of obesity only for mothers who are authoritative. Second, the failure to recognize the importance of general parenting style in leveraging or impeding the impact of practices may explain part of the ineffectiveness or modest effects of previous obesity prevention programs (Haynos & O'Donohue, 2012; Monasta et al., 2011) which have not included general parenting style in interventions. In case future obesity interventions address parenting style, we add the caveat that obesity has multiple causes and prevention efforts focused only on the interaction of parenting or feeding styles and parental feeding practices would ignore important genetic (Kilpeläinen et al., 2011) and other environmental (Townsend, Lorenzi, & Widmaier, 2008) variables. Nonetheless, the results of the current study are in line with others in suggesting that one component of successful future child obesity prevention may be general parenting style (e.g., Gerards et al., 2012; van der Horst et al., 2007).

Our findings on the direct relation of CFSQ demandingness to overweight were qualified by the significant interaction between demandingness and healthful modeling we identified in the logistic regressions of odds of BMI $\geqslant$ 85th percentile. This qualification is very important in shedding light on how feeding styles and practices interact to protect children in obesogenic environments. Specifically, although demandingness in our sample functioned as a protective factor in that it was negatively related to overweight, when parents scored below the median on demandingness and, thus, risk for overweight was higher, healthful modeling reduced children's odds of overweight. In the current study, CFSQ demandingness and PBQ-HS authoritative style shared only 7% of their variance in common. Thus, some of the protective nature of healthful modeling may be due to the fact that some mothers low in CFSQ demandingness who used healthful modeling were also high in authoritative parenting style. Further, modeling may be a proxy variable for a healthful home food and activity environment, as suggested by the correlations we report, such that the protective effect of modeling may be a combination of modeling and parental practices that include the availability of healthful foods and promotion of physical activity.

The interaction between healthful modeling and CFSQ responsiveness in predicting odds of BMI $\geqslant$ 95th percentile revealed a different pattern than the interaction of healthful modeling with demandingness for BMI $\geqslant$ 85th percentile. Odds of obesity, albeit not significant, were lower for those children who experienced both high responsiveness and increasing healthful modeling. This difference in pattern is consistent with the possibility that, as child BMI increases beyond overweight to obesity, parents' combined feeding styles and feeding practices may be a response to weight

or weight concern (Ventura & Birch, 2008). These findings were among many revealed by exploratory analyses we conducted to promote hypothesis generation. Thus, future longitudinal research is needed to evaluate this hypothesis.

The current findings on moderation effects by both parenting and feeding styles underscore the importance of additional research on both of these measures of *how* parents communicate and interact with children rather than *what* parents do. Inconsistent findings across studies of child obesity have led to previous calls for targeting demographic variables as moderators to determine the different child obesity risk factors for subpopulations (Ventura & Birch, 2008). The current study extends the call for research on moderators from demographic variables to parenting and feeding styles – conditions that influence how feeding and other practices relate to obesity. Longitudinal designs and multivariate analyses (e.g., structural equation modeling) are critical to advance the understanding of parenting styles, feeding styles, and feeding practices as predictors of child weight status and to identify potentially effective prevention strategies. Although there are a few longitudinal studies of the links between parenting styles and child weight status (Agras et al., 2004; Olvera & Power, 2010; Rhee et al., 2006), we are not aware of any longitudinal studies of feeding styles. Moreover, very few studies have evaluated race/ethnicity and parental education or income as potential moderators of parenting styles or feeding styles as predictors of child weight status (see Hughes et al., 2006; Topham et al., 2010 for exceptions). Thus, this gap and the complex interplay of styles and practices as predictors and moderators of child weight status over time need to be addressed.

While the current study did not suggest any specific set of parenting practices linked to child weight status, we did identify important practices that were effective or harmful when combined with particular parenting styles. Healthful modeling protects against obesity when combined with authoritative parenting. Reducing screen time, soda drinking, fast food and take-out consumption, and high-fat/high-sugar snack availability protect against obesity when combined with a non-authoritative style. Covert control increases risk for obesity when implemented by more authoritarian parents. These findings provide a list of combinations of practices and styles that may help parents and educators.

As with all studies, there are limitations to the current investigation. Feeding styles along with parenting styles and practices were all based on parental self-report, which may be influenced by social desirability and other response biases. The reliability of two of our measures, the child-centered subscale of the CFSQ and PDMS modeling, was somewhat low. We did conduct a number of exploratory analyses which decreased the possibility that some of those significant findings may be due to Type I error. The same concern applies to our setting significance for interactions at $p < .10$. Finding the balance between the long-recognized Type II error rate that characterizes evaluations of interaction effects in 91% of simulated field (correlational design) studies (McClelland & Judd, 1993) and the possibility of Type I error is a challenge that needs to be addressed systematically by research methodologists. Finally, we sampled children from low-income families, which restricts generalizability of conclusions to this population.

Additional research is needed on moderation by general parenting styles of the relation of parent feeding and other practices to young children's BMI *z*-scores and weight status. Because this is the first study to identify the importance of this moderating effect in the child literature, replication is indispensable. Future research might profitably compare continuous measures of parenting styles such as the one we employed with measures that assess parenting styles as categories to examine whether the current findings are generalizable to categorical measures of parenting styles.

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